

South Atlantic Bight Synoptic Offshore Observational Network

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LONG-TERM GOAL

The long-term goal is to evaluate underwater television for providing fishery managers real-time visual data on reef fish communities which will contribute to making and/ or modifying fishery management regulations.

OBJECTIVES

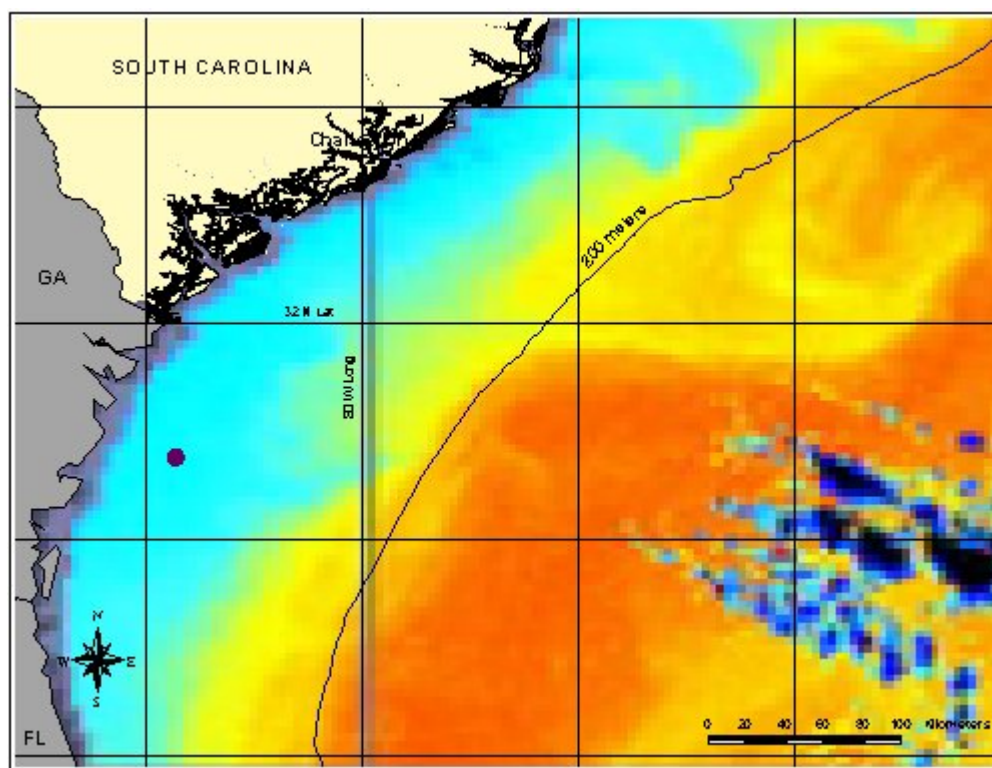
There are several objectives which will be integrated with the oceanographic observations of the overall SABSOON project and include: 1) identification of environmental conditions associated with the formation of prespawning aggregations of gag grouper, 2) determination of temporal changes in visual indices of abundance of fish species for which no commercial harvest is allowed, and 3) correlation, if any, of resuspended bottom sediments to fish community structure. The scientific objectives will require successful establishment of a reliable underwater TV system, which can provide near full motion video for long periods of time.

APPROACH

We have established an underwater TV research site and associated reef fish community approximately 45 miles off the coast of Georgia (Fig. 1). Transmission of digital image data is from a bottom mounted camera system, through a network at the Skidaway Institute of Oceanography (SkIO), and to our laboratory in Charleston, SC via an established USN (Tactical Air Combat Training System) microwave linkage to shore. The UWTV was deployed in association with some low relief structures to aggregate fish. This "remote sensing" research required the application of image capturing and transmission software and hardware. Deployment and maintenance have been with the assistance from the Director and dive crews of the Gray's Reef National Marine Sanctuary. Observations of the diversity of one mid-shelf reef fish community over time represents a significantly different approach to monitoring offshore fish populations. Observations and counts of the fish populations will be conducted daily and correlated with subsurface oceanographic conditions and surface winds measured by collaborators at SkIO.

Issues investigated by this research include: seasonal movements of members of the reef fish community, the potential for development of indices of abundance for some migrating populations, and any seasonal behaviors associated with the formation of prespawning aggregations. Information from direct observations via UWTV is increasing and may contribute in the future to informed fisheries

management decisions on: the relative proportion of specific populations participating in regional spawning movements, any prespawning subpopulations, and residency times of prespawning aggregations. An underwater TV camera system offshore allows study of fishes on the bottom throughout the year without the costly trips to a research site in inclement weather. Images of fish and their behavior are available to both scientists and the general public via the World Wide Web through several web sites and, at a later date, via SC ETV in real time video of specific temporal data sets. The resulting capability should enhance fisheries biologists' understanding of fish behavior and movements within the region.



1. Location of underwater television site in relationship to Gulf Stream waters.

WORK COMPLETED

The research site was established in 25-28 m of water off central Georgia on May 11, 1999 with the deployment of several large fish attraction units. On August 24, the underwater TV cameras, cable and the computer were installed and confirmed to be functioning correctly. With the preliminary system components and communication linkages in place off the coast of Georgia, still images and brief video clips are being retrieved daily from recorded files. The system of cameras, cables and computers are submerged in or in close proximity to salt water and, therefore, represent a high maintenance system. In addition, the communication linkage requires rerouting, upgrading and modifications to ensure increased efficiency and increased access to visible data. We remain a way from our ultimate goal of full motion video, although the SABSOON web site presently allows easy public access (<http://www.dnr.state.sc.us/marine/mrri/fishwatch/home.htm>) to still images.

RESULTS

We have learned how to deploy and maintain the underwater TV system and remote operation systems. A calendar of species presence and activities has been initiated. Dates of first observation or presence of fish species are especially important for identification of any prespawning migration to the south by adult grouper. Seasonal changes in the makeup of a fish community near an artificial reef appear much greater than generally believed. The annual cycle of tremendous recruitment of juveniles in spring and summer followed by equally large predation by transient species later in the year is being documented.

The scientific objectives of the observational research are dependent on reliability of the system, visibility within the water column, and establishment of a near camera fish community. The camera system has been relatively dependable through several meteorological events (hurricanes Dennis and Floyd; 1999), although high winds and seas do reduce visibility and may obscure the field of view with resuspended fine bottom materials for several days or weeks (hurricane Gordon; 2000). The fisheries research data can easily be gathered during brief daily counts of fish present near the cameras. Although the species recognition of large commercially and recreationally important species is dependent on the resolution of the cameras, identifications have been relatively easy to date. Large schools of bait fish have been present in most seasons accompanied by schools of predatory amber jacks. The subjects of our interest, snapper and grouper species, have yet to establish resident populations at the site. Our observations will continue.

At this time, the most pressing underwater system needs are to: streamline network systems to allow reliable and easy access to images, and rearrange the fish attraction structures around the multi-camera unit to ensure that all cameras have good fish habitat within view. This last will require a well coordinated cruise of divers and a period of near perfect weather. Continual upgrading of the transmission and communication network will be required until we achieve unrestricted access to the camera images, while working toward near real-time, full motion video capabilities.

IMPACT/APPLICATION

Potential for obtaining valuable fisheries management information from observations is dependant on the elimination of both commercial and recreational fishing at the research site and establishment of a permanent reef fish community over a long time period. If the fish species of management concern are rapidly removed from the area by fishing, the primary questions of interest will not be adequately addressed. Populations of adult grouper have been known to increase at sites in the Gulf of Mexico where fishing was non-existent (Lindberg, 1996). Prespawning groupers, which have not been observed yet at the UWTV, may annually visit established sites along historic migration corridors. One such site, which was visited by large numbers of gag grouper in late November and early December each year in the 1980's, was the Savannah lighthouse (Gilligan, personal comm.), which was destroyed by an at-sea collision. The UWTV research site may require several years to establish transient populations of species of management concern. Any information on the timing and spatial extent of a gag grouper aggregation, especially if the fish were in prespawning condition, could contribute significantly to the management of this declining species.

Fishery management information from visual observations will accumulate over time. Observations of rare fish species of the snapper and grouper management complex may allow some estimate of temporal

increases in populations of species which are illegal to commercially harvest and land. An example of useful data would be temporal changes in the relative abundance (counts) of the red porgy, Pagrus pagrus. The red porgy was once one of the most important commercially landed species in the South Atlantic Bight region. At present, population levels are so low from overfishing, that a moratorium on fishing for this species has been established by the South Atlantic Fishery Management Council. There is a good probability that a fishery closure will be in place for up to 18 years. Only one red porgy has been observed at the site within the 1999-2000 year. During that or a similar period, traditional fisheries data from any illegal harvest will be unavailable, therefore any improvement in the population size in response to the fishery regulations in place would have to come from fishery independent counts/estimates, such as non-harvest TV observations. At present, no harvest is allowed for speckles hind (*Epinephelus drummondhayi*), jewfish (*E. itahara*), warsaw grouper (*E. nigritus*). All these species are considered “over-fished” and by definition are rare individuals with low population levels. Any change in the observation frequencies of the presently rare species, possibly resulting from the enactment of restrictive fishing regulations, may require a 5-10 year period for beginning recovery of the regional stocks.

Further fishery management information will be provided from the observations of any long-term surplus biological potential or adult spawning stock that may take up residence at the research site over time. These types of data would contribute to decisions on the use of fishery reserves or unfished areas as management tools to allow part of the total reef fish populations protection from harvest and to ensure spawning of large and commercially vulnerable adult fish.

An undescribed relationship between a local snapper-grouper community and the near-bottom sediment/turbidity levels may exist at mid-shelf locations such as the TV camera site. Any statistically significant relationship should be easily determined by correlating fish counts and species diversity with light and visibility levels measured or estimated at the cameras.

TRANSITIONS

Estimates of water visibility offshore from recent images have been used by Gray’s Reef Sanctuary and SC DNR divers in planning offshore research efforts. Use of the visual fish community information by management agencies will be from scientific publications of research results. The general public will greatly increase their awareness of fisheries issues when access to the video images is more readily available at the web site.

RELATED PROJECTS

Fishery biologists have been investigating the relationships between environmental conditions and fish populations for many years. Other projects of the South Atlantic Bight Synoptic Offshore Observational Network (SkIO) are focused on the meteorological and in situ oceanographic conditions near the UWTV research site; there resulting data will be integrated into our understanding of fish community dynamics. Also, SC DNR fishery scientists are conducting research on fish communities of artificial reefs that are not fished to evaluate the establishment of Marine Fisheries Reserves as a fishery management tool. The UWTV system will provide a long temporal data series on fish abundance and behavior that will not be influenced by either the presence of divers or by removal sampling techniques.